NIDHAL BOUAYNAYA

Department of Systems Engineering
University of Arkansas at Little Rock (UALR)
2801 S. University Ave. – 300H ETAS
Little Rock, AR 72204

Phone: (501) 683-7666
Fax: (501) 569-8698
E-mail: nxbouaynaya@ualr.edu
URL: http://syen.ualr.edu/nxbouaynaya/

RESEARCH INTERESTS

Genomic Signal Processing; Dynamical Systems; Multidimensional Signal Processing; Image and Video Analysis; Mathematical Modelling of Signals and Systems; Mathematical Morphology.

HONORS / AWARDS

- **University of Illinois Fellowship**, 2006-07.

- **Provost Award for Research**, 2006.

- **Best Student Paper Award** at SPIE Conference on Visual Communications and Image Processing, 2006.

- **Gold Medal** in Expo Poster session for UIC College of Engineering Advisory Board Meeting, 2005.

- **Finalist for Best Student Paper Award** at SPIE Conference on Image and Video Communications and Processing III, 2005.

- French Government **Fellowship of Excellence**, 1996 – 2001.

EDUCATION

Ph.D. August 2007
University of Illinois at Chicago
Department of Electrical & Computer Engineering
Concentration: Signal Processing and Communications
Thesis title: "Protein Communication Channel: Analysis of Proteomics and Genomics Based on Signal Processing and Communication Theory"
Thesis advisor: Prof. Dan Schonfeld, IEEE fellow.

M.S. May 2007
University of Illinois at Chicago
Department of Mathematics
Concentration: Pure Mathematics
GPA: 5.0 / 5.0

M.S. May 2002
Illinois Institute of Technology
Department of Electrical & Computer Engineering
Concentration: Signal Processing
Thesis title: "High Speed Digital Imaging of the Larynx"
Thesis advisor: Prof. Nikolaos P. Galatsanos

B.S. May 2002
Ecole Nationale Superieure de l'Electronique et de ses Applications
Department of Electrical & Computer Engineering

RESEARCH GRANTS

- N. Bouaynaya (PI)
"Extension of the MUSIC algorithm to AM-FM signals"
Arkansas Department of Higher Education (ADHE)
$4000
01/2010 – 08/2010.

- D. Schonfeld (PI)[33%], N. Bouaynaya (co-PI)[33%], and H.M. Fathallah-Shaykh (co-PI)[33%]
"Minimal-Perturbation Dynamic Control of the Melanoma Gene Regulatory Network"
National Institutes of Health (NIH)
$1,200,000
2010-1014

PROFESSIONAL AFFILIATIONS

- Member: Institute of Electrical and Electronics Engineers (IEEE),
                   Women In Engineering and the Society of Women Engineers.

PROFESSIONAL SERVICE

Organizing Committee	IEEE International Workshop on Genomic Signal Processing and Statistics, 2009.
Publicity Chair	IEEE International Workshop on Genomic Signal Processing and Statistics, 2009.
Vice Chairman	IEEE Signal Processing Society Chicago Chapter, 2006-2007.

Program Committee /Reviewer

- IEEE Transactions on Parallel and Distributed Systems;
- IEEE Journal of Selected Topics in Signal Processing-Special Issue on Genomic and Proteomic Signal Processing;
- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Circuit and Systems for Video Technology
- IEEE Communications Magazine
- Journal of electronic imaging
- IEEE Conference on Advanced Video and Signal based Surveillance.
- IEEE Signal Processing Magazine
- Nature Methods

INVENTION DISCLOSURES

Dan Schonfeld and Nidhal Bouaynaya, "Dynamic Tree Programming: Extension of the Viterbi Algorithm to Multidimensional Systems", February 20, 2006.

PUBLICATIONS

Journal Papers

1. N. Bouaynaya, R. Shterenberg, and D. Schonfeld, "Inverse Perturbation for Optimal Intervention in Gene Regulatory Networks", *Bioinformatics*, submitted March 2010.

2. N. Bouaynaya, M. Charif-Chefchaouni, and D. Schonfeld, "M-idempotent and Self-Dual Morphological Filters", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, submitted June 2009, revised May 2010.

3. L. Gong, N. Bouaynaya and D. Schonfeld, "Information-Theoretic Model of Evolution over Protein Communication Channel", *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, accepted, 2010.

4. N. Bouaynaya and D. Schonfeld, "On the Optimality of Motion-Based Particle Filtering", *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 19, no.7, pp. 1068 – 107, 2009.

5. N. Bouaynaya and D. Schonfeld, "Non-stationary Analysis of Coding and Non-coding Regions in Nucleotide Sequences", *IEEE Journal of Selected Topics in Signal Processing*, vol. 2, no. 3, pp. 357-364, June 2008.

6. N. Bouaynaya, M. Charif-Chefchaouni and D. Schonfeld, "Theoretical Foundations of Spatially-Variant Mathematical Morphology Part I: Binary Images", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 30, no. 5, pp. 823 – 836, May 2008.

7. N. Bouaynaya and D. Schonfeld, "Theoretical Foundations of Spatially-Variant Mathematical Morphology Part II: Gray-Level Images", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 30, no. 5, pp. 837 – 850, May 2008.

8. N. Bouaynaya and D Schonfeld, "Protein Communication System: Evolution and Genomic Structure", *Algorithmica*, vol. 48, no. 4, pp. 375–397, August 2007.

9. N. Bouaynaya, M. Charif-Chefchaouni and D. Schonfeld, "Spatially-Variant Morphological Restoration and Skeleton Representation", *IEEE Transactions on Image Processing*, vol. 15, no. 11, pp. 3579-3591, November 2006.

10. D. Schonfeld and N. Bouaynaya, "A New Method for Multidimensional Optimization and Its Application in Image and Video Processing", *IEEE Signal Processing Letters*, vol. 13, no. 8, pp. 485 – 488, August 2006.

11. N. Bouaynaya and D. Schonfeld, "Motion-based particle filtering for head tracking applications", *Electronic Imaging Newsletter*, vol. 15, no. 2, pp. 8, June 2005 **(Invited Paper)**.

Conference Papers

1. Jerzy Zielinski and Nidhal Bouaynaya "Statistical Sequential Analysis for Detection of Microcalcifications in Digital Mammograms", *in IEEE International Conference On Signal Processing And Communications,* Bangalore, India, July 2010.

2. Jerzy Zielinski, Nidhal Bouaynaya and Dan Schonfeld "Two-Dimensional ARMA Modeling for Breast Cancer Detection and Classification", *in IEEE International Conference On Signal Processing And Communications,* Bangalore, India, July 2010.

3. Ahmad AbdulSadda, Nidhal Bouaynaya and Kamran Iqbal, "Noninvasive Breast Tumor Localization Based on Ultrawideband Microwave Backscatter", *in IEEE International Conference On Signal Processing And Communications,* Bangalore, India, July 2010.

4. Yasir Rahmatallah, Nidhal Bouaynaya and Seshadri Mohan "ARMA Companding Scheme With Improved Symbol Error Rate For PAPR Reduction in OFDM Systems", *in IEEE Wireless Telecommunications Symposium,* Tampa, Florida, April 2010.

5. Nidhal Bouaynaya and Dan Schonfeld "Adaptive Mathematical Morphology: A Unified Representation Theory", *in IEEE International Conference on Image processing (ICIP'09),* Cairo, Egypt, November 2009, pp. 2265 – 2268.

6. Ahmed Abdulsadda, Nidhal Bouaynaya, and Kamran Iqbal, "Stability Analysis and Breast Tumor Classification from 2D ARMA Models of Ultrasound Images", *in IEEE International Conference of the Engineering in Medicine and Biology Society (EMBC'09),* Minneapolis, Minnesota, September 2009.

7. Nidhal Bouaynaya, Dan Schonfeld and Radhakrishnan Nagarajan, "Analysis of Temporal Gene Expression profiles using Time-Dependent MUSIC Algorithm", *in IEEE International Workshop on Genomic Signal processing and Statistics (GENSIPS'09),* Minneapolis, Minnesota, May 2009.

8. Jerzy S Zielinski, Nidhal Bouaynaya, Dan Schonfeld and William O'Neill, "Time-Dependent ARMA Modeling of Genomic Sequences", *in Proceedings of BMC Bioinformatics,* vol. 9, Suppl. 9, 2008.

9. N. Bouaynaya and D. Schonfeld, "Emergence of New Structure from Non-Stationary Analysis of Genomic Sequences", *in IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS'08)*, Phoenix, June 2008, pp. 1-4.

10. N. Bouaynaya and D. Schonfeld, "Non-Stationary Analysis of Genomic Sequences", *in IEEE Statistical Signal Processing Workshop*, Madison, WI, August 2007, pp. 200-204.

11. L. Gong, N. Bouaynaya and D. Schonfeld, "Information-Theoretic Bounds of Evolutionary Processes Modeled as a Protein Communication System", *in IEEE Statistical Signal Processing Workshop* , Madison, WI, August 2007, pp. 1-5 **(Invited Paper)** .

12. N. Bouaynaya and D. Schonfeld, "The Genomic Structure: Proof of the Role of Non-Coding DNA", *in IEEE International Conference of the Engineering in Medicine and Biology Society (EMBC'06)*, New York City, August 2006, pp. 4544-4547.

13. N. Bouaynaya and D. Schonfeld, "Biological Evolution: Distribution and Convergence Analysis of Amino Acids", *in IEEE International Conference of the Engineering in Medicine and Biology Society (EMBC'06)*, New York City, August 2006, pp. 2045 - 2048.

14. N. Bouaynaya and D. Schonfeld, "Analysis of Protein Evolution as a Communication System", *in IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS'06)*, College Station, TX, May 2006, pp. 23-24.

15. N. Bouaynaya and D. Schonfeld, "Active Surfaces for Video Tracking and 3-D Segmentation Based on a New Method for Multidimensional Optimization", *in Visual Communications and Image Processing (VCIP'06)*, vol. 6077, San Jose, CA, January 2006.

16. N. Bouaynaya and D. Schonfeld, "Spatially-Variant morphological image processing: theory and applications", *in Proceedings of SPIE Visual Communications and Image Processing (VCIP'06)*, vol. 6077, San Jose, CA, January 2006 **(Best Student Paper Award)**.

17. N. Bouaynaya and D. Schonfeld, "Complete system for head tracking using motion-based particle filter and randomly perturbed active contour", *in Proceedings of SPIE, Image and Video Communications and Processing (IVCP'05)*, vol. 5685, San Jose, CA, March 2005, pp. 864-873. **(Finalist for Best Student Paper Award)**.

18. N. Bouaynaya, W. Qu and D. Schonfeld, "An Online Motion-Based Particle Filter for Head Tracking Applications", *in IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'05)*, vol. 2, Philadelphia, PA, March 2005, pp. 225-228.

19. W. Qu, N. Bouaynaya and D. Schonfeld, "Automatic Multi-Head Detection and Tracking System using A Novel Detection-Based Particle Filter and Data Fusion", *in IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'05)*, vol. 2, Philadelphia, PA, March 2005, pp. 661-664.

TEACHING

SYEN 2315/2115 "Circuits and Systems" (lecture/lab)
http://syen.ualr.edu/nxbouaynaya/SYEN2315.html

SYEN 3310/3110 "Dynamic Systems: modeling and Simulation" (lecture/lab)

SYEN 3314 "Probability and Random Signals"
http://syen.ualr.edu/nxbouaynaya/SYEN3314.html

SYEN 3312 "Optimization Methods in Systems Engineering"
http://syen.ualr.edu/nxbouaynaya/SYEN3312.html

SYEN 4350/5399 "Digital Signal Processing" (undergrad./grad.)
http://syen.ualr.edu/nxbouaynaya/SYEN4350.html

SYEN 4399/5399 "Statistical Signal Processing: Estimation Theory" (undergrad./grad.)

SYEN 4399/5399 "Statistical Signal Processing: Detection Theory" (undergrad./grad.)